DENON

SERVICE MANUAL

FULLY AUTOMATIC DIRECT DRIVE TURNTABLE SYSTEM

MODEL DP-61F SERIES



NIPPON COLUMBIA CO., LTD.

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WARNING:

1. Component parts

Parts marked with \triangle and/or shading in this service manual have special characteristics important to safety. Be sure to use the specified parts for replacement.

2. Leakage current

Before returning the appliance to customer, test the leakage current when the power plug is connected. Use a calibrated (with an error of not more than 5%) leakage current tester and measure the leakage current from any exposed metal to the earth ground. Reverse the power plug polarity and test the above again.

Any current measured MUST NOT EXCEED 0.5 miliamps. Corrective measure must be taken if it exceeds the limit.

FEATURES

The use of a microprocessor controlled, contactless servo tonearm

An innovative microprocessor controlled, contactless servo tonearm ensure safe, easy to use automatic operations with little loss in sound quality.

2. Q-damping method (Dynamic servo tracer)

Low frequency resonance caused by cartridge compliance and the tonearm mass is electronically damped horizontally and vertically. Crosstalk and inter-modulation distrotion are effectively suppressed. The dynamic servo tracer maximizes the performance of the low mass tonearm and realizes excellent stability of sound image with little noise or distortion.

3. Low mass straight arm

This arm is fully capable of maximizing the performance of high compliance cartridges with outstanding tracing ability. Even with the newest, high grade records, its tracing ability is outstanding.

4. Locate function

Just by pressing the locate button, the tonearm is moved to any desired location where the record play is started.

Record size detector and the automatic speed selector mechanism

The record size and the speed are automatically set when using LP records (33 1/3 rpm) or single records (45 rpm). When there are no records placed on the turntable, the tonearm does not move, even if the start button is pressed. This protects the stylus tip from unexpected damages.

Thick precision turntable platter exhibits superb acoustic characteristics

The use of a thick turntable platter to minimize vibrations transmitted from external sources is essential for clear sound reproduction.

7. Excellent rotational characteristics

The DP61F's high performance AC servo motor; magnetic record head speed detection system; quartz lock, bi-directional servo result in phenomenal performance specifications; 0.008% wrms (rotation system) wow and flutter; 82 dB (DIN-B) S/N ratio and rotational accuracy of 0.002%.

8. Beautifully finished wood cabinet

DENON's tradition of products superbly crafted from the finest materials is continued with the DP-61F.

MAIN SPECIFICATIONS

Drive system: Servo controlled direct drive

Turntable speeds: 33-1/3 rpm, 45 rpm

Wow flutter: Below 0.008% wrms (servo system)

Below 0.02% wrms (JIS)

S/N ratio: Over 82 dB (DIN-B)

Rise time: Normal speed within 1.5 seconds (at 33-1/3 rpm)

Turntable: Aluminum die-cast; 300 mm diameter

Motor: AC servo motor

Speed control system: Speed servo by frequency and phase servo control

Load influence: 0% (80 g stylus force, outer most groove)

Brake system: Electronic brake
Speed deviation: Below 0.002%

Power supply: 50/60 Hz, Voltage is shown on the rating label at the back of

cabinet.

Power consumption: 13 W

Dimensions: $455 \times 150 \times 445 \text{ mm } (\text{W} \times \text{H} \times \text{D})$

Weight: Approx. 11 kg

Arm type: Dynamically balance, straight tube tonearm

Effective length: 244 mm

Overhang: 14 mm

Tracking error: Within 2.5°

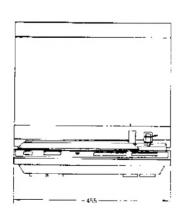
Automatic mechanism: Electronically controlled fully automatic Q-damping method: Electronic; horizontal vertical directions

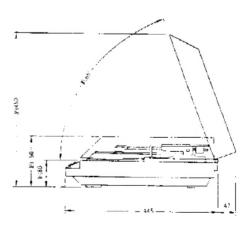
Adjustable tracking force range: 0~3 g (1 scale=0.1 g)

Head shell: Specially hardened resin head shell (Approx. 3.3 g)

Suitable cartridge weight range: Approx. 3~12 g (including nuts, screws)

Anti-skating: Electronically controlled

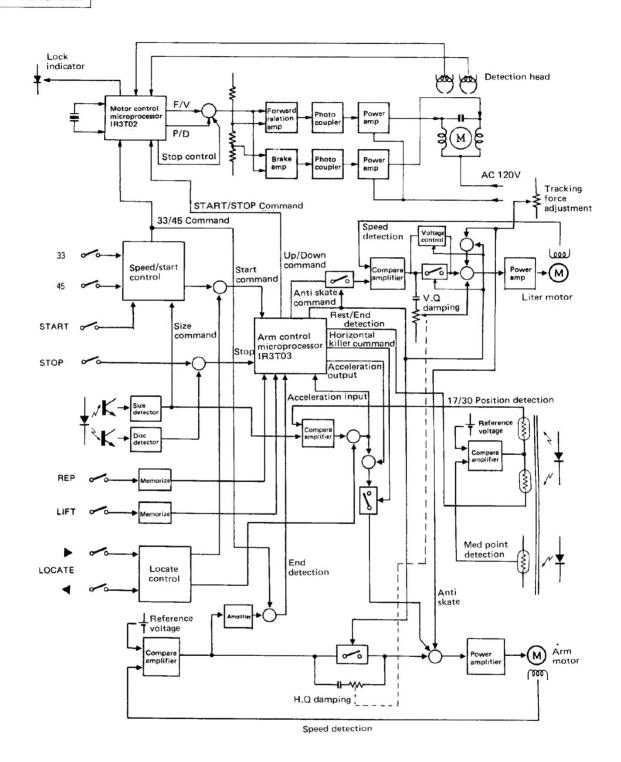




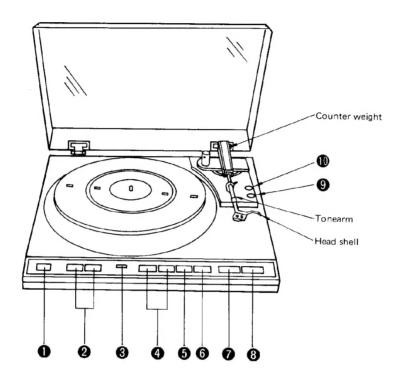
OUTER DIMENSIONS (mm)

^{*} The above specifications are subject to change without notice.

BLOCK DIAGRAM



NAMES AND PARTS AND FUNCTIONS



1 Power switch POWER

This turns the power supply on and off. Push the button down until it locks in position. The power will turn on and the lock, indicator (LOCK) will light up. When turning the power off, press the button until the lock is disengaged. In addition, always return the tonearm to the arm rest and hold it in place with the clamp.

2 Speed selector switch 33 SPEED 45

Set to the desired record speed.

3 Lock indicator LOCK

The "LOCK" will light up when the power is on. During play, the lamp will flicker until the proper turntable speed is reached. Once the proper speed is obtained, the lamp will, again, stay lit.

4 Locate button LOCATE

Press this button to move the tonearm to the right or left, away from the record center, to start the record at any desired location.

5 Arm lifter button UP LIFTER

This button is used to raise and lower the arm during play, or when playing the records manually.

6 Repeat button ON REPEAT

Press this button when playing records repeatedly: the "REPEAT" lamp will be lit.

7 Start button START

Press this button when starting the records automatically.

8 Stop button STOP

Press this button when stopping the record during play.

9 Tracking force adjustment knob TRACKING FORCE

This is used to adjust the tracking force.

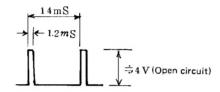
10 Q-damping adjustment knob Q-DAMPING

EXPLANATION OF THE MICROPROCESSOR

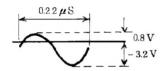
Motor Control IC ... IR3T02 (at standard revolution of 33 rpm)

The numbers on the left hand size indicates the terminal number.

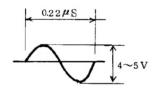
1. Strove drive



2. 4.5MHz OSC



3. 4.5MHz OSC



4. rpm selector

H: 45 rpm L: 33 rpm

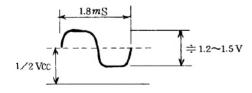
5. Power source input

Vcc: 5V ± 0.5V

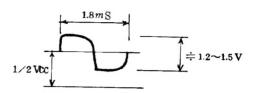
6. FGI bypass terminal

E6 = ½Vcc

7. FGI lowpass terminal



8. FG I output



9. FG I inverse input

The gain set element is connected. E9 = $\frac{1}{2}$ Vcc

10. FG I non-inverse input

 $10 \text{mVpp} \sim 100 \text{mVpp}$ E10 = $\frac{1}{2} \text{Vcc}$

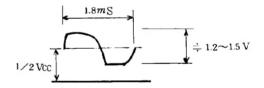
11. FG II non-inverse input

 $10 \text{mVpp} \sim 100 \text{mVpp}$ E11 = $\frac{1}{2} \text{Vcc}$

12. FG II inverse input

The gain set element is connected. E12 = $\frac{1}{2}$ Vcc

13. FG II output



14. Ground terminal

15. F/V output

slower than normal revolution: 2 ~ 4.5V normal revolution:

2 ∨ 4.5V faster than normal revolution: 0 ~ 2V

16. F/V hold terminal

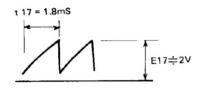
same as terminal 15

17. F/V triangular wave

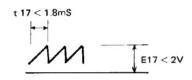
slower than normal revolution



normal revolution



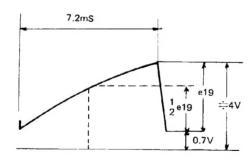
faster than normal revolution



18. Timing pulse width-set terminal

E18 = 0.6V

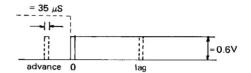
19. PD triangular wave



Note:

PD: Phase Detector

20. Sample pulse monitor terminal



21. PD hold terminal

slow phase: $2 \sim 4V$ normal phase: $\pm 2V$ advanced phase: $1 \sim 3V$

22. PD output

same as terminal 21

23. Lock detector time set terminal

during lock: 0.6V lock disengaged: 0V

24. Direction detector output

25. Revolution detector

during revolution: \longrightarrow \Rightarrow 4
stop: 0V

26. START/STOP terminal

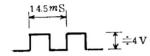
 $H \rightarrow START$ L $\rightarrow STOP$

27. Stop output

during stop control: 0V during start: open

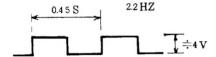
28. Lock indicator

during lock (LED lit dimly)
69 Hz



stop(LED lit)

during transition . . (LED flashes)



• Arm Control IC IR3T03

The numbers on the left side indicates the terminal number of the IR3T03.

1. Acceleration input

Except for the matching range of the lead-in detector (E7 \leq | \pm 0.6V |), it will recognize the situation and control the acceleration during automatic tonearm operation.

2. Acceleration output

E1 \leq | ± 2.37 V ± 0.1 V | open (will not control the acceleration within the matching range)

 $E1 \ge |\pm 2.37 \lor \pm 0.1 \lor |$. . . $E2 \Rightarrow \pm 3.95 \lor$

-3.95V: will accelerate toward the inside from rest.

+3.95V: will accelerate toward rest from the inside.

3. UP/DOWN selection of the arm lifter

When E9 is H, the control output for lifting the arm will be made at E3 \rightleftharpoons -Vcc.

When E9 is L, the control output for lowering the arm will be made at E3 $\stackrel{.}{=}$ +Vcc.

4. Detection of the rest position

 $E4 \le -2.64V$ will be recognized as the arm being at rest.

5. Detection of the END position

When E5 \geq 2.64V, it will be recognized to be within the END detection range.

6. End control

Within the END detection range of 5 (above), (E5 \geq 2.64V), the arm will be returned by the END control when E6 \geq 0.23V.

7. Matching input

E7 \geq | \pm 0.6V | will be recognized as the match range for lead-in.

8. Drive output

Connect to GND.

9. UP control output

When the lifter is in the UP position during automatic arm operations or when the UP signal is sent by pressing the arm lifter button, pin 9 will be at H level.

E9L ≑0V

10. DOWN time constant

To ensure that the arm is lowered completely before proceeding to the next movement, a resistor between pins 9 and 10 and a capacitor on pin 10 has a preset discharge time constant which is somewhat longer than the time required for the arm to be lowered. Thus, when pin 9 becomes L (E9L \rightleftharpoons 0V), and the fixed amount of time elapses, the arm will be recognized to be DOWN as soon as E10 < 2V.

11. ANT (Anti-skating) control

When E10 < 2V, then E11 \doteqdot -4V will be the control output needed for the anti-skating to be engaged.

When E10 \geq 2V, then E11 \Rightarrow +4V will be the control output needed for the anti-skating to be disengaged.

12. Negative power source

Supplies -5V.

14. SUB (substratum)

To prevent any interference from the inner elements of the LSI, the substratum terminal is connected to the unregulated side of the negative power source, since it has the lowest electric potential.

15. GND

Standard zero electric potential is the GND.

17. Return control

When the stop command is given, or when the repeat is disengaged and the END is detected (E6 \ge 0.23V), a control signal output (E17H > 4V) is made to return the arm to rest.

E17H > 4V E17L: release

18. Horizontal drive control

When the arm is in resting position, or when the arm reaches the lead-in position during automatic play, and comest into the matching range (E7 \leq | \pm 0.6V |), a control signal output (E18H \rightleftharpoons 4V) is made to stop the horizontal motion of the arm.

19. Initial set

This is the preparation time setting terminal when the power source is turned on. The resistor in the LSI and the outer capacitor will set the charge time constant and carry out the initial set.

20. LCTD (Located) time constant

The LSI and its outer circuits will set the LCTD time constant to improve the detection accuracy of the lead-in position and the arm rest position.

E20H = 1.2V A few moments after the arm reaches the range of detection, in other words, after the set LCTD time constant elapses, it will become H level, where it is memorized immediately and then

reset to the L level.
E20L≑0V Before and after detection, it will become L level.

21. Turntable (T/T) Drive Control

22. Turntable (T/T) Start Position

This terminal establishes the turntable start position. The turntable will start when the arm separates from the arm rest and pin 22 is released, under manual and auto modes.

23. Start

Will start automatically at the GND level.

24. Auto stop

Will stop automatically at the GND level.

25. Lifter

Will raise the lifter automatically at the GND level.

26. Repeat

Will engage the repeat automatically at the GND level.

27 UP SW

When the arm lifter is raised, this terminal will be opened and made H level, otherwise, the UP detector will control it to make it GND level.

With this model, photo reflectors to detect the presence of reflected light from a light emitting diode and a sensor is placed opposite to the reflector cam. When the lifter is in the UP position, the reflector cam blocks the ray of light, and the raised lifter position is detected, as there is no reflection.

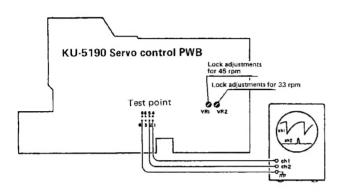
28. Positive power supply

Supplies +5V.

ADJUSTMENT METHOD

Adjusting the phonomotor section

Prepare a two-channel oscilloscope for the measuring instrument; make the adjustments in the following order. CH-1 Probe connect to test point TP1 of the motor control circuit board, and CH-2 Probe connect to test point TP'2. Both probe ground terminal connect to G.

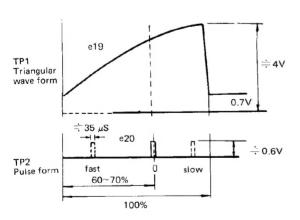


Adjusting the head gap

Make sure the detection head is in right angle to the magnetic coating surface of the turntable. The gap of the detection head should be adjusted to 0.18 mm. Be careful the head is not tilted to the left or the right.

2. Lock adjustments for 45 rpm

- Place a record on the turntable; fix the arm to the armrest.
- After pressing the start button, set the speed selector switch to 45 rpm.
- Adjust VR1 so that the positions of the triangular wave form and the pulse form TP2 are as shown in the diagram below.



3. Lock adjustments for 33 rpm

 Set the speed selector switch to 33 rpm and proceed to adjust VR2, just as in the adjustments for 45 rpm.

Adjusting the arm control section

1. Adjusting the horizontal OP amp. offset voltage

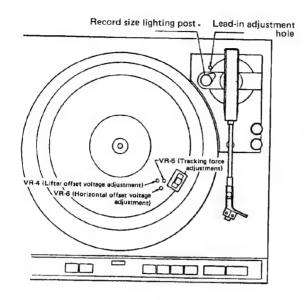
- Fix the tonearm to the arm rest and connect the oscilloscope to TP5.
- 2) Set the lifters switch to the UP condition.
- 3) Turn VR-6 and adjust to 0V±0.01V.

2. Adjusting the lifter OP amp. offset voltage

- Fix the tonearm to the arm rest and connect the oscilloscope to TP-6.
- 2) Set the lifter switch to the DOWN condition.
- After about 7 seconds, adjust to 0V±0.01V by turning VR-4.

3. Adjusting the tracking force

- 1) Turn the power supply switch OFF.
- Take the arm off the arm rest. Rotate the balance weight so that the tonearm becomes parallel to the turntable surface when let go.
- Return the arm to the arm rest and turn the power supply switch ON.
 - (Note) Cover the size detecting photo transistors (2 pieces) with a rubber sheet or something to avoid that light enters.
- 4) Wait 7 seconds after the arm has lowered. Place the cartridge stylus tip onto a stylus force gauge and set the tracking force adjustment knob to 1.5 g.
 - (Note) At this time, the stylus tip height should be adjusted so that it is about the same height as during play.
- Turn VR-5 and adjust, so that the stylus force gauge reads 1.5 g. (Turn VR slowly.)



4. Adjusting the 30 cm lead-in position

 Place a 30 cm record on the turntable and set the record size selector switch to "30".

(Note) Keep the bottom cover closed.

2) Move the arm so that the stylus tip is at approximately the 30 cm lead-in position. Insert a small flat-headed screwdriver into the lead-in adjustment hole; move the arm back and forth and fit the screw driver into the groove of the cam inside gently. 3) After the turning the screwdriver, pull it out once. Press the start switch and adjust so that the stylus position stops as the 30 cm lead-in position.

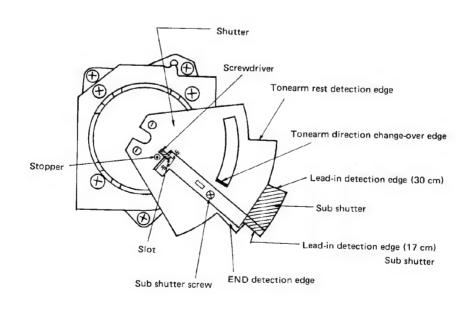
(Note) The 30 cm lead-in adjustments cannot be performed unless the stylus tip position is approximately in the 30 cm lead-in position. In addition, if the screwdriver is left inserted, the arm will not move.

5. Adjusting the 17 cm lead-in position

Adjust as necessary, such as when parts of the sensor section have been replaced.

However, the following procedures should only be used when a discrepancy is found for the 17 cm lead-in position, after the 30 cm lead-in position has been adjusted.

- The size is automatically changed by placing a 17 cm record on the turntable.
- 2) By continuously pressing the start switch, the arm will move over and stop. At this time, check now many millimeters, toward the inside or outside, the stylus tip deviates from the required 17 cm lead-in position.
- Take off the bottom cover of the cabinet and check the adjustment scale position of the shutter. (One adjustment scale corresponds to a stylus tip movement of 0.5 mm.)
- 4) Untighten the screw holding the sub shutter and place a small flat-headed screwdriver into the slot of the shutter When the stylus position is toward the inside, compared to the required position, move the sub shutter toward the right of the scale; when the stylus position is toward the outside, move the sub shutter toward the left. When completed, tentatively tighten the screw holding the sub shutter.
- After the adjustments are made, press the start switch and check whether or not the stylus stops at the 17 cm lead-in position.
- 6) If the stylus stops at the required position, then tighten the sub shutter screw.



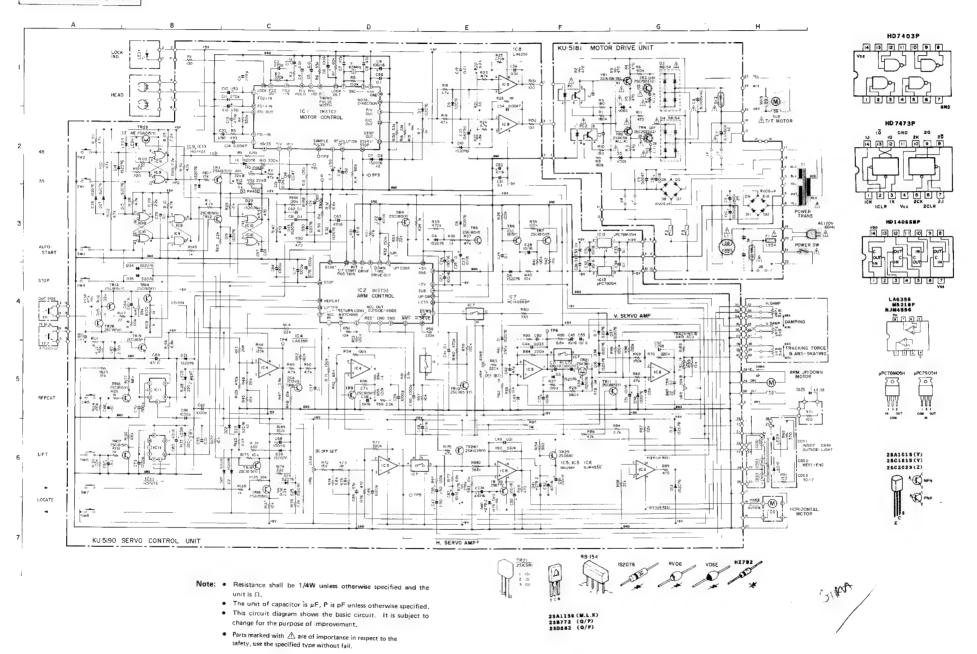
PARTS LIST OF EXPLODED VIEW

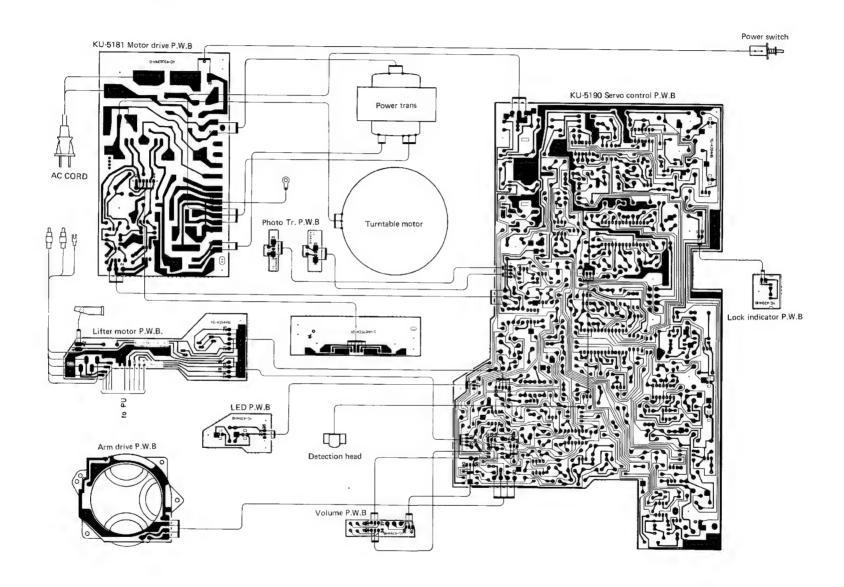
Ref. No.	Part No.	Part Name	Remarks
1	1018448006	CABINET	
2	4018054002	HINGE HOLDER	
3	4418551008	BUSHING PLATE (F)	
4	4418313204	BUSHING PLATE (E)	
5	4128818206	SHIELD PLATE	
6	1468158519	FRAME	
7	4318095101	FRICTION SHEET	
8	3158911103	ARM LEST ASS	
9	4498074000	LED STAND	
10	3939220000	LED WITH WIRE	
11	1468159000	TOWER	
12	1038238704	FRONT PANEL	
13	1038240307	SUB PANEL	
14	1138009006	DENON MARK	
15	1138169508	BUTTON (A) ASS'Y	
16	1138171305	BUTTON (B) ASS'Y	
17	1138172207	P.S. BUTTON ASS'Y	
18	4638637304	SPRING	
19	4428123206	POWER S.W. BRACKET	
1 20	2129136028	POWER SW	
∆ 21	2178078001	MOTOR ASS'Y	
22	KU-5190	SERVO CONTROL UNIT	PRESIDENT PERSONAL PROPERTY AND
23	KU-5181	MOTOR DRIVE UNIT	
24	3158962000	TONE ARM ASS'Y	
25	3158958001	WEIGHT ASS'Y	
26	4338175205	YOKE (A) ASS'Y	
27	3158712108	LATERAL WEIGHT	
28	2398013215	COIL ASS'Y	
29	3418025205	MAGNET ASS'Y	
30	4248019202	ADJUST CAM	
31	3158451003	FRICTION WASHER	
32	4751005004	4W	
33	4761003009	3E RING	
34	4338281005	SHUTTER	
35	4338280006	SUB SHUTTER	
36	4438545201	COLLAR	
37	4638225004	SPRING	
38	4428155009	CORD BRACKET	
39	2031640000	OUTPUT CORD	
40	EP-7376	CORD STOPPER	
41	4148181007	SHIELD SHEET	
A 42	2339062005	POWER TRANS	
43	4620027003	RUBBER BUSH	Patricia de Salación de Cal
	2062019008	AC CORD	
/N 44			
△ 44	MD-3802	BUSHING	
₫ 45	MD-3802 1058241108	BUSHING BOTTOM COVER	
A	MD-3802 1058241108 FMD05241	BOTTOM COVER	
45 46 47	1058241108 FMD05241	BOTTOM COVER INSULATOR	
45 46 47 48	1058241108 FMD05241 3918425004	BOTTOM COVER INSULATOR MAGNETIC HEAD	
45 46 47 48 49	1058241108 FMD05241	BOTTOM COVER INSULATOR	
45 46 47 48 49 50	1058241108 FMD05241 3918425004 1128077309	BOTTOM COVER INSULATOR MAGNETIC HEAD KNOB	
45 46 47 48 49 50 51	1058241108 FMD05241 3918425004 1128077309 3158600003	BOTTOM COVER INSULATOR MAGNETIC HEAD KNOB HEAD SHEEL ASS	
45 46 47 48 49 50 51 52	1058241108 FMD05241 3918425004 1128077309 3158600003 4218387113	BOTTOM COVER INSULATOR MAGNETIC HEAD KNOB HEAD SHEEL ASS RUBBBER SHEET	
45 46 47 48 49 50 51	1058241108 FMD05241 3918425004 1128077309 3158600003	BOTTOM COVER INSULATOR MAGNETIC HEAD KNOB HEAD SHEEL ASS	

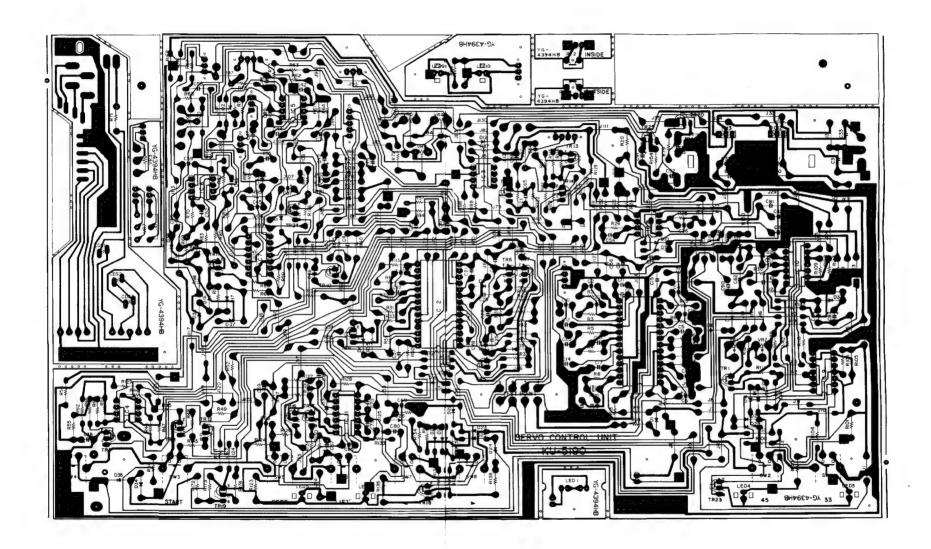
Ref. No.	Part No.	Part Name	Remarks
56	3158898006	FRICTION SCREW	
57	4730309019	3x16 CBRTS (1)	
58	4732309017	3x16 CFTS (1)	
59	4730306012	3x12 CBRTS (1)	
60	4733812008	3×12 CBTS (1)	
61	4730310011	3×20 CBRTS (1)	
62	4730308010	3x14 CBRTS (1)	
63	4713302017	3x5 CBS	
64	4730305013	3x10 CBRTS (1)	
65	4756133007	14N	1
66	4712306014	3x12 CFS	
67	4734304000	3×3 BSS (D)	
68	4711810019	2x3 CPS	
69	4713303045	3×6 CBS	
70	4711303018	3x6 CPS	
71	4770192008	SPECIAL SCREW	
72	4725802000	2.7×20 COWS	
73	4700009019	3×6 CPSW	
74	4018041028	HINGE	
75	4770018001	WASHER (P-87)	
76	4618155000	PAD	1
77	4751003006	3W	
78	4733808012	3X12 CBTS (1)	[

WARNING

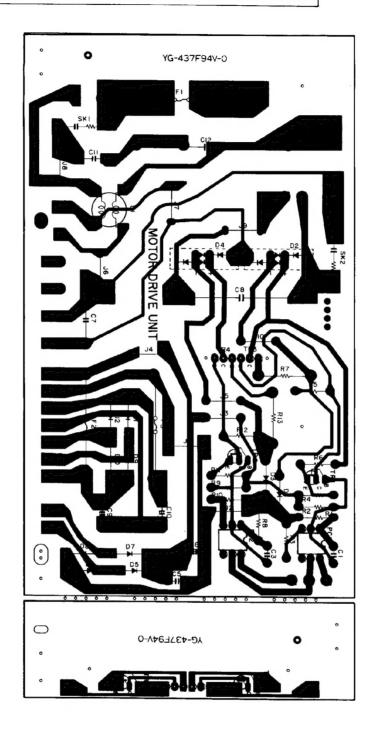
Parts marked with A and/or shading have special characteristics important to safety. Be sure to use the specified parts for replacement.







P.W. BOARD OF KU-5181 MOTOR DRIVE UNIT



PARTS LIST OF P.W. BOARD

KU-5190 SERVO CONTROL UNIT

Ref. No.	Part No.	Part Name	Remarks
SEMICOND	UCTOR GROUP		
IC1	2630173004	IR3T02	
IC2	2630174003	IR3T03	
IC3, 5	2630257001	M5218P	
IC4, 8	2630237005	LA6358	
IC6	2630198005	NJM4556D	
IC7	2620276006	HD14066BP	
IC9, 10	2620218005	HD7403P	
IC11	2620057004	HD7473P	
IC12	2630147001	μPC78M05H	
IC13	2630160004	µРС7905Н	
TR1,8	2710102005	2SA1015 (Y)	
18, 19	2710102005	25A1015 (1)	
23, 24			
TR20	2720055020	300772 (O/D)	
	2720055029	2SB772 (Q/P)	
TR4~7 9~17	2730198002	2SC1815 (Y)	
TR25	2740078031	2SD882 (Q/P)	
TR21	2750043014	2SK381 (C/D)	
D1~39	2760043014	1S2076	
D1-39	2760049008	HZ7B-2	
TH1	276031038		
LE1	3939185006	TD5C210D	
LE3~5	393919008	LN202GP2 GL-5EG23	
LE6, 9	3939219008	LN202GP2	
10	3939041001	LINZUZGFZ	
CD1, 2	3030053003	CDC	
CD1, 2	3939053002		
	3939053028	CDS	
T1, 2	3939157005	TPS605	
RESISTOR	GROUP	т	
			Metal film
R11	2452223006	RN14K2E473G	47KΩ 1/4W
R12	2452207006	RN14K2E103G	10KΩ ¼W
R20	2452195008	RN14K2E332G	
			3.3KΩ ¼W
R21	2452147001	RN14K2E330G	3.3KΩ ¼W 33Ω ¼W
R21 R22		RN14K2E330G RN14K2E182G	
	2452147001		33Ω ¼W1.8ΚΩ ¼W
	2452147001		33Ω ¼W1.8ΚΩ ¼W
R22	2452147001 2452189001	RN14K2E182G	33Ω ¼W 1.8KΩ ¼W Variable resistor
R22 VR1, 2	2452147001 2452189001 EP-5462H15	RN14K2E182G SOLID VR	33Ω ¼W 1.8KΩ ¼W Variable resistor 22KΩ
R22 VR1, 2 VR3~5	2452147001 2452189001 EP-5462H15 2116000073	SOLID VR V08PB203	33Ω ½W $1.8K\Omega$ ¼W Variable resistor $22K\Omega$ $20K\Omega$
R22 VR1, 2 VR3~5 VR6	2452147001 2452189001 EP-5462H15 2116000073 2118024015	RN14K2E182G SOLID VR V08PB203 V16V20KB502	33Ω ½W $1.8K\Omega$ ½W Variable resistor $22K\Omega$ $20K\Omega$ $5K\Omega$
R22 VR1, 2 VR3~5 VR6	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502	33Ω ½W $1.8K\Omega$ ½W Variable resistor $22K\Omega$ $20K\Omega$ $5K\Omega$
R22 VR1, 2 VR3~5 VR6 VR7	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502	33Ω ¼W 1.8ΚΩ ¼W Variable resistor 22ΚΩ 20ΚΩ 5ΚΩ 5ΚΩ x2
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502	33Ω ¼W 1.8KΩ ¼W Variable resistor 22KΩ 20KΩ 5KΩ 5KΩx2
R22 VR1, 2 VR3~5 VR6 VR7	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502	33Ω ¼W 1.8ΚΩ ¼W Variable resistor 22ΚΩ 20ΚΩ 5ΚΩ 5ΚΩ x2
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502	33Ω ¼W 1.8KΩ ¼W Variable resistor 22KΩ 20KΩ 5KΩ 5KΩx2
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502	33Ω ¼W 1.8KΩ ¼W Variable resistor 22KΩ 20KΩ 5KΩ 5KΩx2
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77 78, 84	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017	SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502	33Ω ¼W 1.8KΩ ¼W Variable resistor 22KΩ 20KΩ 5KΩ 5KΩ 2Ceramic
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77 78, 84 85, 86	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017 R GROUP	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502 CK45B1H102K	33Ω ½W $1.8K\Omega$ ½W Variable resistor $22K\Omega$ $20K\Omega$ $5K\Omega$ $5K\Omega$ 2
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77 78, 84 85, 86 C90	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017 R GROUP 2531004007	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502 CK45B1H102K	33Ω
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77 78, 84 85, 86 C90 C14, 54	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017 R GROUP 2531004007	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502 CK45B1H102K CK45B1H332K CK45B1H472K	33Ω
R22 VR1, 2 VR3~5 VR6 VR7 CAPACITO C39, 40 46, 70 73, 77 78, 84 85, 86 C90	2452147001 2452189001 EP-5462H15 2116000073 2118024015 2118064017 R GROUP 2531004007	RN14K2E182G SOLID VR V08PB203 V16V20KB502 V1620V20KB502 B502 CK45B1H102K	33Ω

Ref. No.	Part No.	Part Name	Remar	
C25, 26	2531027000	CK45F1H104Z	0.1μF	50V
29, 30				
33, 34				
37, 41		i		
56, 58				
61, 62				
79, 81				
C7, 8	2533619005	CC45SL1H470J	47PF	50V
42, 89				
C1, 2	2533637003	CC45SL1H271J	270PF	50V
11, 13				
65				
			Electrolyt	ic
C71,72	2544130007	CE04W1A101=	100μF	10V
C21, 22	2544009002	CE04W1A470=	47μF	10V
C6, 23	2544015009	CE04W1C100=	10μF	16V
28, 31	2014010005	0204010100-	ΤΟμΡ	100
32, 38				
45, 48				
51, 53				
75, 82				
87				
C63, 69	2544017007	CE04W1C470=	$47\mu F$	16V
74, 80				
92				
C9, 24	2544018006	CE04W1C101=	100μF	16V
27, 50				
68, 91				
C64	2544019005	CE04W1C221=	220µF	16V
C35	2544145005	CE04W1HR47=	0.47µF	50V
C3, 10	2544146004	CE04W1H010=	1µF	50V
12, 17				
18, 20				
47, 55				
66, 67				
			Film	
C4, 5	2551072006	CQ93M1H103K		50V
49	2001072000	2433M11102K	0.01μF	50V
C52	2551075000	COOSMALIASSIA	0.040 =	F.6.1
C52 C44	2551075003	CQ93M1H183K	0.018µF	
	2551078000	CQ93M1H333K	0.033µF	50V
C16	2551122008	CQ93M1H473J	0.047μF	50V
C15	2554194017	CQ93P1H473J	0.047μF	50V
OTHER PA	RTS GROUP			
	4178028101	HEAD SINK	IC12, 13	
	4428122207	VR BRACKET	VR3,7	
X1	3998023002	CRYSTAL	4,5 MHZ	
SW1~8	2129218001	TACT SW		
	4438568107	LED HOLDER		
	2050158049	4P WRAPPING		
		TERMINAL		
	2050185038	3P WIRE HOLDER		
1		4P WIRE HOLDER		
	2050185041			
	2050185041			

[•] The carbon resistors rated at ¼W are not listed herein.

KU-5181 MOTOR DRIVE UNIT

WOICK D	MIVE UNIT	
Part No.	Part Name	Remarsk
CTOR GROUP		
2710159003	2SA1156 (M.L.K)	
2730196004	2SC2023Z	
2760057029	V06E	
2760280003	RB154	
2760237001	RV06	the Management of the Co.
3939027012	PC-613G	
ROUP		
2440005029	RS14B3A010JNBF	1Ω 1W
GROUP		
		Ceramic
2531002009	CK45B1H471K	470PF 50V
2531008003	CK45B1H472K	0.0047µF 50V
		Electrolytic
2544018006	CE04W1C101=	100μF 16V
2544086009	CE04W1E222M	2200μF 25V
2559000000	CC02020 A C10414	Film
2556000039	CQ93F2CACTU4W	0.1µF 160VAC Metallized
2568026016	CF93=2DAC505J	5μF 200VAC
TS GROUP		
2618006009	SPARK KILLER	
2398001007	LINE FILTER	
	COIL	
2061024010	FUSE 1.25A	
FEP12802	MINI CONNE	
	PIN	
EE-1656	BASE TERMINAL	
2050087026	2P TERMINAL	
2050185067	6P WIRE HOLDER	
2058007008	TERMINAL	
E120211041	FUSE RATING	
3136211041		
5138211041	LABEL	
	Part No. CTOR GROUP 2710159003 2730196004 2760057029 2760280003 2760237001 3939027012 ROUP 2440005029 GROUP 2531002009 2531008003 2544018006 2544086009 2558000039 2568026016 TS GROUP 2618006009 2398001007 2061024010 FEP12802 EE-1656 2050087026 2050185067	2710159003

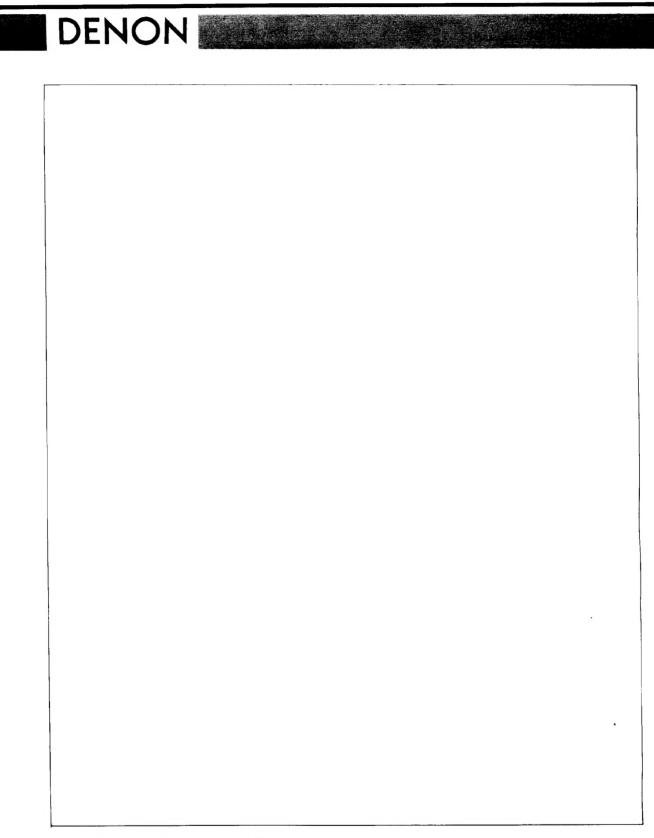
 $[\]bullet$ The carbon resistors rated at $\mbox{\%W}$ are not listed herein.

WARNING:

Parts marked with A and/or shading have special characteristics important to safety. Be sure to use the specified parts for replacement.

ACCESSORIES AND PACKING GROUP

Ref. No.	Part No.	Part Name	Remarks
	5058023018	ENVELOPE	T/T
	5058017011	ENVELOPE	ARM
	5018321213	CARTON CASE	
	5018322005	BOTTOM PALTE	
	5018323101	UPPER PLATE	
	5018331106	BACK PACKING	
	5138279038	RATING SHEET	
	5028142000	PAD	ARM
	5038050108	PACKING ASSY	
	5058092036	LAMINATE	
		ENVELOPE	
	5298006002	45 ADAPTOR	
	4018041028	HINGE	
	5298042008	OVER HANG	
		GAUGE	
	5118286009	INSTRUCTION	
		MANUAL	
	3158547001	SHELL ACCES-	
:		SORY ASS	



NIPPON COLUMBIA CO., LTD.

No. 14-14, 4-CHOME AKASAKA, MINATO-KU, TOKYO JAPAN TEL: 03-584-8111 TLX: JAPANOLA J22591 CABLE: NIPPON COLUMBIA TOKYO